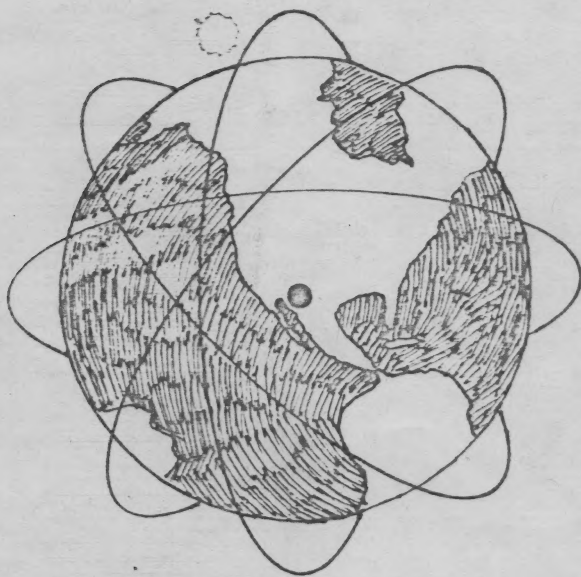


RADIATION, HUMAN HEALTH, and SURVIVAL



HELEN CALDICOTT M.D.

RADIATION, HUMAN HEALTH AND SURVIVAL

Today I'm going to give a medical sermon. It's medical because of the nuclear age. We've reached the turning point in the evolution of life on earth and unless people learn very fast what science has done to our world, we're not going to survive. And I believe that survival is God's work. I believe that if we destroy ourselves and all life on earth, that is not God's work, that is Satan's work. So our task today and in the next couple of years is to educate ourselves as rapidly as possible about the implications of the nuclear age and reverse it. If we don't, the greatest brains at Harvard predict that our chances of survival for the next twenty years are less than 40 percent.

Now how did we get into this position? When Einstein discovered the theory of relativity, he realized what mankind would do with the atom; and he wished he'd been a locksmith and that he hadn't ever discovered the theory of relativity. And mankind has certainly done what Einstein predicted.

Early in the Manhattan Project, scientists developed reactors in order to make plutonium, a man-made element, which is fuel for atomic bombs. After Hiroshima and Nagasaki, the guilt wrought among those scientists was so great that they decided they could harness split atoms for peaceful purposes. Now the energy from splitting an atom is 20 million times greater than any other chemical reaction. It is cosmic energy, like energy from the sun -- something that we had never experienced before. So in 1952, Einstein gave the "Atoms for Peace Address" at the United Nations and said, "We will harness atoms for peace."

People really believed that there would be big, stainless steel, bubbling, quiet nuclear power plants all over the world producing energy which was too cheap even to meter. At that time we didn't understand the long-term effects of radiation. Leukemia was just starting to appear among the survivors of Hiroshima. Leukemia

increased 30 times among the survivors. And the old radiologists who had used x-rays with gay abandon were starting to die of leukemia and bone cancer; their hands were dropping off because they had irradiated their hands. Medically, we were just starting to learn what radiation means to the human body.

Nuclear Power Industry: Infant of Pentagon

The utilities were reluctant to begin to get involved in nuclear power because it was very expensive, it was a very high technology industry and they didn't really understand it -- it was really an infant of the Pentagon -- but they were talked into it by the government and offered big subsidies. So they developed it. It was all classified as secret because it came under national security, because every single nuclear power plant, be it a reactor to make bombs or a reactor to make electricity, makes plutonium. It only takes ten pounds of plutonium to make an atomic bomb and each reactor makes 500 pounds of it every year.

So we've become saddled with nuclear reactors, and you should know that inside each nuclear reactor there is as much radiation as a thousand Hiroshima-type bombs. Even conventional war has become out of the question now, because if you have enemies you can't be dotted around with nuclear power plants. They don't need atomic bombs anymore to destroy you. They just need to drop a big blockbuster inside a nuclear reactor and release all of that radiation and you will all die of epidemics of leukemia and cancer. Mind you, you'll walk around feeling great for a few years, you won't even know you've got radiation inside you because you can't smell it, taste it or see it. But one day you will get a cancer and you'll die.

All Radiation Is Dangerous

Besides this, the nuclear industry makes massive amounts of radioactive waste. Let me talk about radiation a minute. All radiation is dangerous. It all can cause cancer. We get background radiation continuously from the sun. In the past we got a lot more background

radiation before the ozone layer had built up to quite a thick layer that filters out a lot of the radiation. Radiation produces mutations in genes and changes genes. Genes are the building blocks of life. They determine everything about us: our hair coloring, eye coloring, the way we grow, the way our liver grows and functions, the way our heart grows, our brain grows; and if a gene is changed it changes the person. It can give you diabetes, cystic fibrosis, dwarfism, hemophilia, or cancer.

Now in the past, because of the background radiation we have evolved. The background radiation has produced mutations so that fish were able to develop lungs so they could live out of the water. Birds developed wings. The good mutations that mastered the environment survived and the bad mutations, the diseased, died. This is the way we have evolved; it is called "survival of the fittest."

And here we are, this brilliant species. Life has been on earth for two billion years but man has only been here for 30 thousand years. We're relatively new. But the geneticists say that we've reached our maximum point in evolution and all mutations we get now are dangerous and produce disease: there are very few that will do us any good. So that every bit of radiation you get adds to the chances of your getting cancer or having your sperm or eggs affected and so your children affected.

When you have an x-ray, although it carries a very minimal risk, there is a risk. And each x-ray you get adds to your risk of getting a cancer. So don't have an x-ray without absolutely knowing why. We doctors tend to x-ray people too often, as if we were slightly scared of lawyers and didn't want to be sued, so we take an x-ray just to make sure we have evidence. It's said that 40 percent of all x-rays are taken unnecessarily, so be careful and know why you are having an x-ray. They are very important diagnostic tools, but carry a slight risk.

Of all species on earth, human beings are the most sensitive to the effects of radiation. We get cancer most easily. We don't know why. And of all human beings, the unborn baby and young children are exquisitely

sensitive to radiation. One x-ray to the pregnant abdomen increases the risk of leukemia in the offspring by 40 percent -- one x-ray. Children are extraordinarily sensitive.

It Takes One Atom of Radioactive Material

Now what happens in the nuclear fuel cycle is that radiation is released at every single part of the cycle. When uranium is dug out of the ground it emits a radioactive gas called radon. The miners breathe this into their lungs, it stays in their lungs for a long time and the miner doesn't know it's there. It takes about 20 or 30 years for a cancer to develop -- it takes a long time -- and the miner feels terrific, until one day he coughs up some blood. He has an x-ray, and there on the x-ray, in the lung, is a big mass and that is the cancer. How did it develop?

Well, in every cell of your body there are genes. There is a gene in every cell which controls the rate at which that cell divides -- called the regulatory gene. If the radiated particle hits that gene and changes it biochemically, the cell sits quietly for about 20 years and then, one day instead of just dividing in a regulated way to produce two daughter cells, it goes berserk and produces millions and millions of daughter cells in a completely uncontrolled way. That's a cancer. And we can't stop it. So it takes one atom of radioactive material, one cell and one gene, to kill you.

In the past, 20-50 percent of men who have mined uranium have died of lung cancer.

Uranium also has a material called radium. Do you remember years ago women painted the dials of watches with a luminescent paint? That was radium, and they used to lick the paint brush to make it nice and pointy so that the figures were very accurate. They swallowed the radium, it went to their bones, irradiating the bone cells and causing bone cancer, the kind Teddy Kennedy's son had several years ago. It also causes leukemia, because, of course, the white blood cells are made in the bone marrow and leukemia is cancer of the white blood cells. Most of those women died of cancer or leukemia.

When the uranium ore is taken, it's crushed and the uranium is extracted and a lot of spent ore is left lying on the ground and that's called tailings. In Grand Junction, Colorado, there were 100 acres of uranium tailings -- it's nice sandy material. The tailings keep emitting radon gas for hundreds of thousands of years -- the stuff that causes lung cancer. The people of Grand Junction didn't know that this material was radioactive, so they mixed it with concrete and they made houses, thousands of houses, hospitals, schools, highways, and airports with it. Children in those houses have an increased incidence of cleft lip, cleft palate and congenital deformities, and people are dying of increased incidence of cancer. The government is starting to knock the buildings down but it's an expensive process.

The Government Said It Was Safe

In South Australia, where I live, there are 60 acres of uranium tailings left lying on the ground. The children played there for years. They rode their bicycles, fished in the creek where the fish were concentrating the radium from the tailings, and the children were lying in the sun, fishing, and breathing radon gas. The government said it was safe. They admitted they didn't have any medical knowledge and they really didn't understand it, but they reassured the people and told them not to worry.

It's like Brzezinski, when the satellite burnt up in the atmosphere and released three million curies of plutonium, strontium 90, radioactive iodine, into our atmosphere, which is now falling down and concentrating in our foods: he said, "It is safe." And he said, "I told the people it was safe because I didn't want to cause mass hysteria." In other words, everybody, you've got to die quietly; don't make a fuss and, in fact, don't know what you're dying of.

That's what's happening. The nuclear industry and the weapons industry are in this for economic profit that comes first, before public health.

Now, when the uranium is put in the nuclear reactor, you pack it in very closely together, a hundred tons of it, and it reaches critical mass. Usually when uranium reaches

critical mass, you get an atomic explosion, but this is controlled critical mass. It produces a lot of heat and the uranium is submerged in water and the heat makes the water boil. And the water turns to steam and the steam turns the turbine and that produces electricity.

A Sophisticated Way of Boiling Water

So that's all a nuclear reactor is, in fact. It boils water...It's a very sophisticated way of boiling water. It's like cutting a pound of butter with an electrical saw! Because what is made is about 200 radioactive materials, all of which are terribly poisonous and all of which cause cancer.

Every year they have to remove a third of the spent fuel rods because they're so radioactive they can't use them any more. One spent fuel rod is so dangerous that if you lay it on the ground (it's only an inch thick but it's twelve feet long) -- if you lay it on the ground it gives off so much radiation that if you get on a motorcycle and ride past it at 90 miles per hour, the radiation being given off will kill you. And there are thousands of fuel rods in the reactor.

Three New Atomic Bombs Every Day

What they've done in the past, and plan to do in the future, I think, is to take these fuel rods to a reprocessing plant where they dissolve them in concentrated nitric acid; all the radioactive material is dissolved in the nitric acid and they concentrate and remove the pure plutonium. Why? Because that's what you make atomic bombs from.

This country, the United States of America, makes three new atomic bombs every day. When you have enough to overkill the Russian population 40 times and every person on earth several times over! But they make three a day. What is left in the material, in the nitric acid, is stuff like strontium 90, radioactive iodines, cesium, and also some plutonium and several hundred other substances. There are big vats of this high-level, radioactive waste all over the country.

Let me tell you about West Valley. Thirty miles south of Buffalo, New York, Getty Oil set up a reprocessing plant and they went broke. So they said to New York State, "You own this plant now." New York State had no money. There are 600 thousand gallons of high-level radioactive waste which had been neutralized and all the radioactive elements had precipitated to a thick sludge at the bottom, containing a lot of plutonium.

Now if you get ten pounds of plutonium together, that is called critical mass and if that happens you get an atomic explosion. This happened in Russia in 1957 when a similar facility reached critical mass and spontaneously exploded, killing thousands of people and totally devastating several hundred square miles of territory forever. You can't go in there because it will be radioactive forever.

If that happened at West Valley, Buffalo would disappear, or everyone would die; so might Toronto, depending on the direction the wind was blowing. They say there is not enough water in all the oceans of the world to dilute that material to safe levels. Anyway, that's a fallacious argument because when this material leaks into water it's concentrated in the food cycle. Thousands of times in the algae, thousands more times in the little fish, thousands more times in the big fish, and then into us. You don't know you're eating a fish containing strontium 90 because you can't taste it. It's concentrated in the grass, the milk, the meat and breast milk. It's concentrated most strongly in breast milk because we're highest on the food chain. How ironical! Babies are the most sensitive to radiation; they live on milk for the first year of their life. And breast milk is made for human babies: cows' milk is for cows, breast milk is for babies. But we're going to pollute it.

Not the Faintest Idea What To Do with This Waste

A Congressional committee was given one million dollars to investigate the situation at West Valley. Last October they came up with a report which said, "The problem is gargantuan. This is of the essence, and nobody has the faintest idea what to do with this waste."

I went to see Congressman Lundine who represents West Valley. I'm a pediatrician! I walked into his office and he said, "Now, in your wildest thoughts, can you tell me what you would do with that waste? I haven't any idea what to do with it and it's starting to leak into Lake Erie."

In Hanford, Washington, they've lost 400 thousand gallons of similar waste; it's leaking into the Columbia River, which supplies water to the major cities of the Northwest of America. Fish swim thousands of miles, so I guess a fish could land up in Australia, be caught by an Australian and eaten, and years later he could get a cancer.

What happens if someone eats a fish with radioactive iodine? It's absorbed from the gut, travels from the blood to the thyroid gland in the neck, irradiating just a few cells for about 20 years and one day that person will probably develop a thyroid cancer.

What about strontium 90 that concentrates in milk? You know about that from fallout when your country was testing bombs and so was Russia. It's absorbed in the gut, travels to the bone where it causes bone cancer or leukemia.

Plutonium Is Thalidamide Forever

What about plutonium? It is named after Pluto -- the God of Hades. It is man-made. We made it. It is the most dangerous element I have ever read about. One millionth of a gram, an amount you can't even see, if you breathe it into your lungs, will almost certainly give you a lung cancer.

Hypothetically, if you took a pound of plutonium and you could distribute a little piece in every single person's lung -- with one pound you could kill every man, woman and child on earth. Mind you, they'd walk around for 20 or 30 years feeling O.K. before they got their lung cancer.

Each reactor makes 500 pounds of plutonium every year. And it has a half-life of 24,400 years. That means if you start with a pound of it, in 24,400 years

you'd have a half a pound, in 24,400 years a quarter of a pound, and in 24,400 years an eighth of a pound. It is around and poisonous for half a million years and it is not biodegradable.

If I die of a lung cancer induced by plutonium, and I'm cremated, the smoke goes up the chimney, hypothetically, to be breathed into somebody else's lungs with the plutonium. And so on, ad infinitum. Forever.

The body thinks plutonium is iron. So it concentrates it in the liver where it causes liver cancer, in the bone where it causes bone cancer and, in the female, it crosses the placenta into the developing embryo. You remember that drug, thalidamide, that pregnant women took years ago and they had little babies with little hands sticking out of their shoulders, gross deformities -- that's what plutonium will do. It will kill a cell that's going to form the right half of the brain or the left arm. Plutonium is thalidamide forever! Because it does it to one fetus and the next fetus and the next fetus and the next fetus. It concentrates in the testicles and the ovaries where it can mutate the genes and produce increased incidence of diseases like diabetes, like cystic fibrosis, my specialty -- the commonest inherited disease of childhood. One in 20 of us carries the gene for cystic fibrosis -- there are 2,000 diseases like that, like mental retardation, and we can't cure them. We're going to increase these diseases dramatically. But the geneticists say we don't have to worry about that! We won't survive long enough to see that because plutonium is so carcinogenic that we'll all be dead from epidemics of leukemia and cancer long before we live to see the genetic repercussions over generations.

Worth More Than Heroin on the Black Market

They're making all this radioactive waste. By the year 2,020 they will have produced 30,000 tons of plutonium in this country. There will be a hundred thousand shipments of plutonium along the highways every year. It is worth more than heroin on the black market because it only takes ten pounds to make an atomic bomb. Any engineering student can design and make an atomic bomb with available literature in three weeks; all he needs is some plutonium.

Do you know who drives the trucks in this country? The Teamsters Union. You know that trucks disappear every week with valuable cargoes on them. Imagine what's going to happen when plutonium is being driven around! Plutonium metal is spontaneously inflammable if exposed to air, producing tiny aerosolized particles that can be breathed into the lungs. It is the most diabolical material I have ever read about!

Now what does it mean, really? I just said that your country has enough bombs to overkill Russia 40 times and Russia has enough to overkill you 20 times. Do you know that every single town in your country with a population greater than 25,000 people is targeted this instant with a nuclear bomb? Do you know those weapons only take half an hour to get here from Russia, or vice versa, from the time the button is pressed? They go out into space, re-enter the earth's atmosphere at 20 times the speed of sound, and land accurately on target. Do you know the man in charge of the button in your country three years ago was not exactly psychologically stable? Think about it. Do you know that Leonid Brezhnev is a sick man? He's being treated with cortisone, a good drug but occasionally it causes acute psychosis.

The Sanest Men in America

Do you know that the men in the Titan missile silos with ten megaton bombs, each has to pull a lever simultaneously to start a nuclear war? They are called by the Pentagon the sanest men in America. I guess you have to be sane to start a nuclear war! They are both armed with a pistol to shoot the other, if one goes mad. Over the last few years, 30 of them have been certified psychotic!

Do you know that there's an airplane in the air all the time, circling over Phoenix on eight-hour shifts; in that plane are two Generals, each armed with a key, to put into a key hole simultaneously to start a nuclear war? All the time, 24 hours a day. That's in case the White House is blown up so they can start the war. They are both armed with a pistol to shoot the other if one goes mad. They watch each other on the weekends, they watch their

behavior with other women, with their wives, on the golf course. Our whole future is in the hands of those men.

The Nuclear Club: M.A.D.

Now let me go further. As the reactor sales are declining in this country, GE and Westinghouse and their buddies are selling them to Third World countries. You know you gave Viet-Nam a nuclear reactor -- during the war -- and it makes plutonium. South Korea has one -- not a stable government. The Shah of Iran is building 20! He's probably going to build them right on top of his oil fields. He doesn't need electricity. He's got oil. But he's got the third largest air force in the world. And he'll be making atomic bombs.

Taiwan, Pakistan, Brazil, Argentina, are all building nuclear power plants. India made a bomb from one Canada sold her three years ago. All these countries will be making atomic bombs. Why not? It's powerful to enter the portals of the Nuclear Club! America can't say to other countries, "You are not to have atomic bombs. Only we know how to handle atomic bombs. We've got enough to blow you up several times over but you are not to have them." You know other countries don't take that -- they say that's arrogant. And it is!

The fact that every country that has a reactor can make a bomb is terribly worrying. And all the leaders of the world are worrying about proliferation of nuclear weapons because the major powers now have what they call a Balance of Terror. It is called by the Pentagon "Mutually Assured Destruction." And that abbreviates to capital M, capital A, capital D. That's official Pentagon language.

How Did It Happen?

How have we got ourselves into this position? There isn't even a war! There isn't even a war! Yet there are Russian submarines circling your country with nuclear weapons in them all the time, and the same, your country circling Russia with nuclear weapons all the time. And there isn't even a war!

How did the politicians do this? And the scientists? Do you know what's happened? They have lost touch with their most primitive instinct -- and that is the instinct for survival. That is stronger than sex, reproduction, or appetite. Survival. I asked a professor of computer science at MIT the other day, "Why do these men make these bombs when they know what they can do to people?" And he said, "Do you know why? It's terrific fun! You have an insoluble problem -- like how to MIRV a missile, like how to put ten bombs on a missile and get each one to land separately on a target. It's insoluble and you solve it!"

So they're not human beings anymore, you know. Have they ever seen the films of what happened at Hiroshima? Have they ever seen a child die of leukemia? Have they ever seen a beautiful 12-year-old boy, looking like my oldest son, come into the hospital with a few bruises, have a blood picture done, and his blood is full of immature white cells, so he's put in a little room all by himself, barrier-nursed. No one can see him unless they wear a gown and a mask because he musn't catch infection because he might die. He's given nasty drugs which make him feel sick. Everyone smiles at him. Nobody tells him what's the matter. He lives in a state of abject terror for two weeks until one night, in the middle of the night, he dies, bleeding into the bed from his mouth, and his nose, and his lungs.

Have any of our scientists or our politicians ever supported those parents in their grief? Do they know the value of every single human life on earth? I don't think they do. For if they do, they are wicked. If you were a psychiatrist sitting on Mars at this point in the world's history, psychoanalyzing the leaders of the world, you'd have to say that they are mentally unbalanced. And they perhaps should be put in a hospital and treated, for the public health of the citizens of the world.

No Time Left to Muck Around

It is our world. We are the mothers and fathers of the children of the world. It is our world. Nobody gave those men the permission to secure our security by mass genocide. Unless we eliminate every single nuclear weapon and every single nuclear power plant, we will not survive. And we don't have time to muck around!

SALT Talks have never eliminated one nuclear weapon. The U.N. Conference on Disarmament is doing nothing. It consists of old Ambassadors handing little bits of paper around to each other, saying this is just the start and we'll have one in four years and another one in four years, and another one in four years -- till the world blows up!

The people of the world have to learn what science has done to their world! And they have to rise up and demand that the world be saved for our descendants. That is the work of God. That is preventive medicine. Nothing else matters. Why immunize our children, give them good food, love, education, when they probably have no future? What is our responsibility to the human race?

You know we're a brilliant species. We're capable of such creativity, such love, such music, such art -- and such wickedness.. If we can only light up the center of goodness inside everyone's brain to work for our survival, we can easily do it.

The Australian People Act

We did it in Australia. I educated all the Australian people about the dangers of fallout from the French atomic tests in the Pacific and in nine months they rose up, 75 percent of them, marching in the streets; they stopped buying French perfume, they wouldn't unload ships, they didn't deliver French mail, they burnt their berets on television! Then we took France to the World Court and now she tests underground. Australians are apathetic, normally; they don't even know who their Prime Minister is!

Two years later our Prime Minister went to Europe and he said, "We have a lot of uranium; we've got 30 percent of the free world's richest uranium," and he wanted to sell it on the open market to Iran, Japan, Germany, anybody. I realized uranium was used for two things: 1) bombs and 2) nuclear power, and I said, it's grossly hypocritical to sell uranium after the international stand we've made! So I went to the press, but they weren't interested because they had big shares in the uranium mines. So I went to all the unions in Australia, and in nine months I got around to talk to most of the workers in Australia, in their

factories, during their lunch breaks, at the railway yards, at their meetings.

Last year, the Australian Council of Trade Unions, which represents all workers in Australia, passed a resolution that unless the Federal Government holds a national debate for one year on uranium mining, followed by a national referendum, they wouldn't dig it up, they wouldn't transport it, and they wouldn't load it on ships. So you see, you can use your democracy. You've got a democracy. Use it. If you don't use it, you lose it.

I should add, however, that the Prime Minister of Australia has just passed a bill in Parliament saying that anyone who protests against uranium in the streets may be fined \$10,000 and jailed for five years! That is where the nuclear future is leading us. We will lose our civil rights.

And we must die quietly.

Is This Our Future?

You know that town of Rutherford where a lot of the children are getting leukemia? That is a microcosm of what the future holds if we proceed with nuclear power. The people waking up in the morning, their food grossly polluted, their kids dying of leukemia and cancer. It'll be too late. That is the heritage we will leave our children, if they survive long enough without a nuclear war.

So I call on you. Every single person in this church, to take the full responsibility of the human race on your shoulders, like Atlas, and work day and night in order to save life on earth.

* * *

DR. HELEN CALDICOTT

Helen Caldicott, an Australian-born pediatrician, is currently Associate in Medicine at the Children's Hospital Medical Center in Boston. A graduate of Adelaide Medical School, her honors include the British Medical Association Prizes for Clinical Medicine and Surgical Anatomy.

Washington Star writer Mary McGrory referred to Dr. Caldicott as a "slim woman of almost radioactive intensity" who has been trying for the last six years to teach people what radiation does to human beings.

Her efforts to educate the Australian public resulted in a ban on French testing of atomic bombs in the Pacific and subsequently in stopping export of uranium from Australia.

Dr. Caldicott's remarks were delivered at a Commemorative Service for Elizabeth Sands Johnson, humanist and activist, who died in June 1977. The Service, which was held at All Souls Church on Sunday, June 4, 1978, was co-sponsored by the Citizens Energy Forum.

Dr. Caldicott spoke without notes and her remarks are transcribed almost verbatim from tape. Copies may be obtained from the Publications Committee of All Souls Church or the Citizens Energy Forum, Box 138, McLean, Virginia 22101. Quantity rates are available.

Printed by
The Publications Committee
ALL SOULS CHURCH, UNITARIAN
16th & Harvard Streets, NW, Washington, D.C. 20009
Rev. David H. Eaton, Senior Minister